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ORIGINAL ARTICLE

Acute postoperative pain at rest after hip and knee arthroplasty: Severity, sensory qualities and impact on sleep

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KEYWORDS

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Summary

Introduction: The management of acute postoperative pain poses a significant challenge in surgical specialities. Despite the prevalence and impact of acute postoperative pain, there is a paucity of published data regarding its occurrence and sensory qualities after joint replacement.

Hypothesis: That a proportion of patients would experience severe acute postoperative pain at rest after total hip replacement (THR) and total knee replacement (TKR).

Materials and methods: Pain was assessed preoperatively, and then five times daily for the first three postoperative days in 105 THR and TKR patients. Pain severity was assessed using a pain Visual Analogue Scale and the sensory qualities of pain were assessed using the pain descriptors from the Short-Form McGill Pain Questionnaire.

Results: Median acute pain scores peaked on the first postoperative day, with 58% of TKR patients and 47% of THR patients reporting moderate-severe pain. Preoperative pain was most frequently described as aching, stabbing and sharp, whereas acute postoperative pain was described as aching, heavy and tender. Night pain disturbed between 44–57% of TKR patients and 21–52% of THR patients on postoperative nights 1–3.

Discussion: These findings demonstrate that acute postoperative pain at rest after joint replacement, particularly TKR, is poorly managed, although it does not reach the severity of preoperative pain.

Level of evidence: Level IV (observational cohort study).

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Introduction

The management of acute postoperative pain poses a significant challenge in surgical specialities. The problem of acute postoperative pain is widespread, with approximately 40% of all surgical patients experiencing moderate-severe acute postoperative pain [1]. Although acute postoperative pain is a frequent and often expected occurrence after surgery, the importance of reducing acute postoperative pain cannot be disputed. As well as the issue of unnecessary patient suffering and discomfort, heightened acute postoperative pain can significantly delay ambulation, lengthen hospital stay, increase the number of unanticipated hospital admissions and contribute to mental decline [2–5]. In the long-term, severe acute postoperative pain is a risk factor for the development of chronic post-surgical pain [6]. Despite these serious and long-lasting consequences, acute postoperative pain is still often undermanaged and remains a significant problem [1,5–7].

Acute postoperative pain after orthopaedic surgery is common [3,5,8–10]. The problem of acute postoperative pain after joint replacement is particularly pertinent for two reasons. Firstly, joint replacement is one of the most commonly performed elective surgical procedures in the NHS, and is predicted to increase dramatically over the coming decades [11], and therefore, the problem of acute postoperative pain will only continue to escalate unless appropriate pain management is implemented. Secondly, joint replacement is predominantly performed to alleviate chronic joint pain [12], and yet a number of patients continue to experience chronic pain after surgery [13], meaning that the surgery has failed for these people. Because acute postoperative pain is a risk factor for chronic pain after joint replacement [14], a reduction in acute postoperative pain severity could reduce the number of patients who fail to achieve long-term benefit from the surgery.

Despite the prevalence and impact of acute postoperative pain, there is a paucity of published data regarding its occurrence and sensory qualities after joint replacement. It is essential that this data is collected, so that the nature of the problem can be established before interventions to improve postoperative pain management are designed and implemented. Therefore, the aim of this study is to prospectively characterise the severity and sensory quality of acute postoperative pain after arthroplasty.

Patients and methods

Patient recruitment

Ethical approval for this study was obtained from the Local Research Ethics Committee. All eligible patients were approached about the study when they attended a preoperative assessment clinic at one Orthopaedic Centre. Inclusion criteria included all patients undergoing a primary total knee replacement (TKR) or primary total hip replacement (THR) because of osteoarthritis. Exclusion criteria included those patients undergoing revision surgery or who declined consent.

Pain assessment

Patient's joint pain at rest was assessed preoperatively, and then five times daily on postoperative days 1–3. At each of these time points, participants rated the severity of their joint pain at rest and the sensory qualities of their joint pain. Pain at rest was assessed for several reasons: because not all patients will be mobilising at each of the in-patient assessment times, because pain at rest is likely to be very distressing to the patient and because pain at rest is considered a manifestation of central pain sensitisation [15] and has been found to be predictive of chronic pain after TKR [16]. To assess pain severity at rest a 100 mm pain Visual Analogue Scale (VAS) was used, which has been found to be a valid tool for measuring pain in the immediate postoperative period [17].

To assess the sensory qualities of pain, the sensory pain descriptors from the Short-Form McGill Pain Questionnaire (SF-MPQ) was used [18]. These consisted of 11 sensory descriptors of pain, and patients were asked to rate the severity of each pain descriptor on a 4-point Likert Scale as none, mild, moderate or severe.

Acute postoperative pain assessment

In the early morning pain assessment, patients completed three questions. These consisted of completing a 100 mm pain VAS for overnight pain severity, indicating whether their pain had woken them during the night (yes/no), and then rating their current pain at rest on a VAS. Patients then completed a VAS for current pain at midday, mid-afternoon and in the evening. During the afternoon pain assessment, patients also rated the 11 sensory descriptors from the SF-MPQ to provide information on the quality of their pain.

Anaesthetic and analgesic techniques

The anaesthetic care for all THR and TKR patients in the study was a spinal anaesthetic with 3 ml of 0.5% plain bupivacaine placed at the L3,4 or L4,5 interspace in either the sitting or lateral position with a pencil point needle. Intraoperatively, the patient was either sedated or had a light general anaesthetic. All patients were given 1 g of intravenous paracetamol 30 minutes before the end of the operation. In the recovery area, immediately postoperative patients received 400 mg of ibuprofen administered orally. A patient controlled analgesia device was started containing morphine 1 mg/ml, a 1-mg bolus dose and a 5-minute lock-out.

Each day postoperatively until discharge, patients received a visit from a pain specialist nurse. Postoperative analgesia consisted of oral or intravenous paracetamol every 6 hours. Oral ibuprofen (400 mg every 8 hours) was also prescribed if no contra-indications were present, such as renal insufficiency, a history of upper gastro-intestinal ulceration or severe asthma. Six-hourly oral codeine phosphate (30–60 mg) and tramadol (50–100 mg) were available on a prescription if needed when the PCA was no longer necessary, with Oramorph 10–20 mg as rescue analgesia.

Table 1 Patient demographics.

	TKR patients <i>n</i> = 38	THR patients <i>n</i> = 67
Median age in years	68 (60–75)	67 (60–73)
Gender (% male:female)	40:60	37:63

Statistical analysis

Descriptive statistics were used to describe the acute postoperative pain experience. Because some of the pain scores were non-parametric, median scores (interquartile range) are presented throughout. The average daily pain score for postoperative day 1, 2 and 3 was calculated from the average of the five pain ratings for each day (overnight, early morning, midday, afternoon and evening). Mann Whitney-U tests were performed to identify significant differences in median scores between unpaired groups.

Results

Patient demographics

Overall, 105 patients participated in the study. Of these, 38 patients had a TKR and 67 patients had a THR. Basic demographics of the participants are displayed in Table 1. For both THR and TKR patients, the median length of hospital stay was 5 days (4–7 days).

Pain severity

Median VAS scores for preoperative pain and then pain at each in-patient assessment time are displayed in Fig. 1. The highest median pain score was preoperatively, and at no point during the in-patient assessment did the median pain score reach that of the preoperative median pain score. Both TKR and THR patients experienced their peak median in-patient pain score on the first day postoperatively. The percentage of patients who had a median daily VAS pain score of ≥ 40 , indicating moderate-severe pain [19], is displayed in Fig. 2. On postoperative day 1, 47% of THR patients reported moderate-severe pain, which decreased

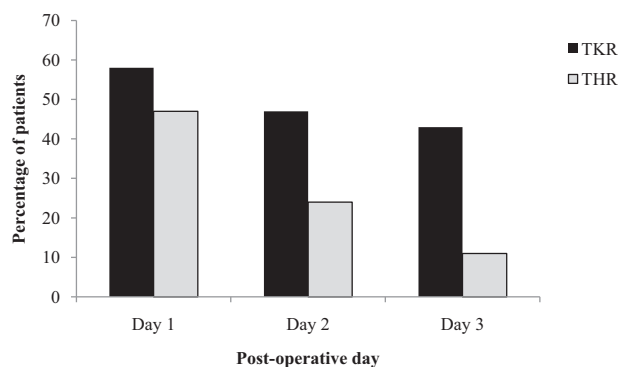


Figure 2 Percentage of patients who rated their pain as moderate-severe (VAS score of ≥ 40) on postoperative days 1–3.

to 11% by postoperative day 3. The number of patients reporting moderate-severe pain after TKR remained relatively constant, with 58% reporting moderate-severe pain on postoperative day 1, which only decreased to 43% by postoperative day 3.

Sensory pain qualities

The sensory qualities of preoperative pain and pain on postoperative day 1, 2 and 3 are displayed in Fig. 3 for TKR patients and Fig. 4 for THR. The figures show the percentage of patients who rated each sensory pain descriptor on the SF-MPQ as either moderate or severe. Preoperative, the pain descriptors that were most commonly chosen to describe osteoarthritic hip and knee pain were aching, stabbing and sharp. During the first 3 postoperative days, the descriptors that were used by the greatest percentage of both THR and TKR patients to describe their acute postoperative pain were aching, heavy and tender.

Pain and sleep

The percentage of patients who were woken each night by their pain is displayed in Fig. 5. On postoperative night 1, 52% of THR patients were woken by their pain, which decreased to 21% by postoperative night 3. The number of patients who were woken by pain after TKR remained relatively constant over the 3 postoperative nights, at between 44–57% of TKR

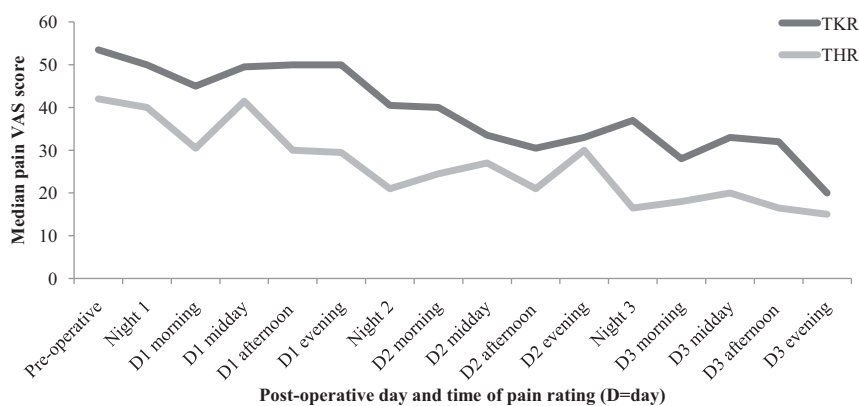


Figure 1 Median pain scores preoperatively and at each in-patient assessment time.

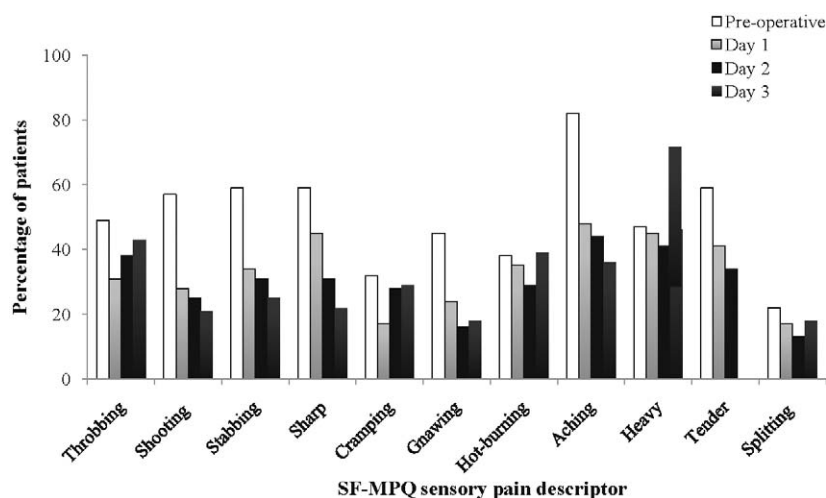


Figure 3 Percentage of TKR patients who rated the SF-MPQ pain descriptors as moderate or severe.

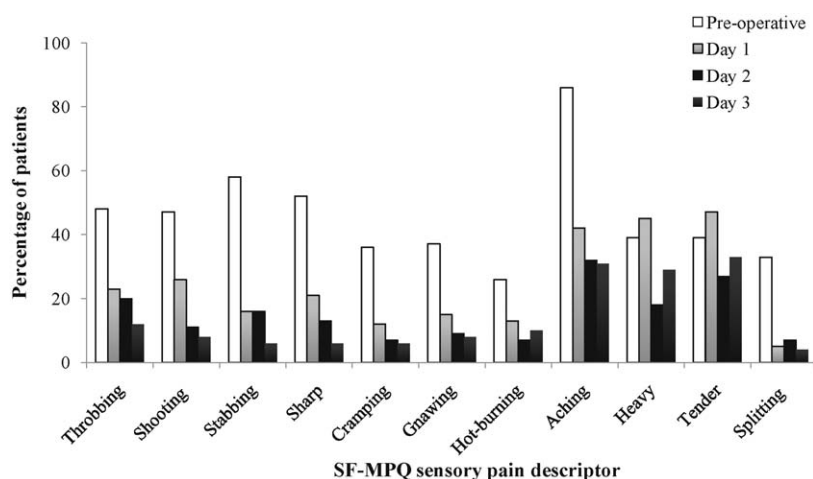


Figure 4 Percentage of THR patients who rated the SF-MPQ pain descriptors as moderate or severe.

Table 2 Median VAS pain scores for patients who were and were not woken by their pain on postoperative nights 1–3.

	TKR patients			THR patients		
	Not woken by pain	Woken by pain	<i>p</i> -value	Not woken by pain	Woken by pain	<i>p</i> -value
Night 1	21 (1–52)	72 (58–83)	< 0.001	12 (3–39)	69 (43–80)	< 0.001
Night 2	22 (6–33)	66 (51–72)	< 0.001	13 (3–31)	43 (22–68)	< 0.001
Night 3	11 (4–28)	59 (34–85)	< 0.001	11 (2–22)	40 (35–56)	< 0.001

patients. Median VAS pain scores for overnight pain were significantly higher for patients who were woken by their pain compared to those who were not woken by their pain each night for both TKR and THR patients (Table 2).

Discussion

This study presents a detailed assessment of the severity and sensory quality of acute postoperative pain after arthroplasty. Many patients experienced moderate-severe acute postoperative pain after arthroplasty, particularly

after TKR. Although this study only assessed pain at rest, other studies have found that acute pain after orthopaedic surgery is even more severe on mobilisation, and interferes with walking ability, which is critical for postoperative recovery and the achievement of physiotherapy goals [5]. Median acute postoperative pain scores at rest peaked on postoperative day 1 for both TKR and THR patients, with 58% of TKR patients and 47% of THR patients reporting moderate-severe pain. Although no direct comparisons were made between pain levels of THR and TKR patients in this study, the difference in pain severity is striking at every pain assessment. Previous studies of acute postoperative pain

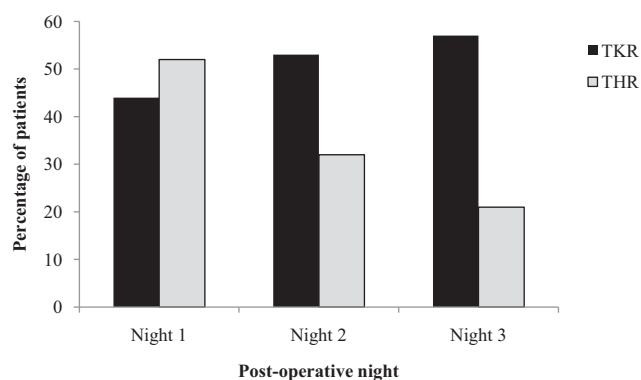


Figure 5 Percentage of patients woken by their pain on post-operative nights 1-3.

have also found that TKR patients experienced more severe acute postoperative pain than THR patients [8]. Therefore, the findings of this study adds to the previous literature research [8,9] to highlight the continuing need for better management of acute postoperative pain after arthroplasty, particularly on the first postoperative day, and particularly after TKR.

As well as assessing pain severity, it is important to also assess the sensory qualities of pain, because "to describe pain solely in terms of intensity is like specifying the visual world only in terms of light flux without regard to pattern, colour, texture and the many other dimension of visual experience" [20]. However, the sensory qualities of pain are often neglected in the assessment of the pain experience. Patients with osteoarthritis have described experiencing two distinct types of pain: a constant aching pain, and an intermittent sharp severe pain [21]. This study found that patients used words such as aching, stabbing and sharp to describe their osteoarthritic pain. Of interest, although postoperative pain became heavy and tender, the aching nature of pain persisted. This suggests that although joint replacement reduces the severity of pain, it does not appear to change the sensory qualities of the pain, in that the aching nature of the preoperative pain persists postoperatively.

Acute postoperative pain disturbed the sleep of a considerable number of patients during postoperative nights 1–3. Each night, approximately half of TKR patients were woken by their pain. Although a similar number of THR patients were woken by their pain on the first night postoperative, this decreased over subsequent nights, to only 21% of patients being woken by their pain on postoperative night 3. As in previous studies, those patients whose sleep was disturbed by pain had significantly worse pain than those that were not woken during the night [22]. Sleep deprivation has a negative impact on many aspects of general health [23], including reducing pain thresholds [24], and can adversely effect postoperative outcomes after surgery [25]. After TKR, patients who reported sleep disruptions at 1-month after surgery reported greater disability at 3-months postoperative [22]. Therefore, it is imperative that night pain is well managed, to improve both the short-term and long-term outcomes of patients after joint replacement.

The findings from this study have limited generalisability because they are specific to the anaesthetic and analgesia used in this study. There are many different

options for controlling perioperative pain including spinal anaesthetic, femoral nerve blocks, local wound infiltration, epidural infusions, intravenous analgesics and oral analgesics. These different pain management techniques for controlling perioperative pain after joint replacement have been well-studied. For example, after both THR and TKR femoral nerve blocks have been found to be more effective in providing pain relief, allowing early mobilisation, reducing length of stay and minimising side effects than other methods of pain control [23,26–29]. However, despite this limited generalisability, this study demonstrates that acute postoperative pain is still undermanaged after arthroplasty with the anaesthetic and analgesia used in this study, particularly after TKR. Whilst this study focused the severity and nature of pain at rest, future research needs to also assess pain on mobilisation, as this can be a hindrance to achieving effective postoperative rehabilitation.

Conflict of interest statement

The authors have no conflict of interests to declare.

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